MPAEA Journal of Adult Education
Volume XXXIII, Number 2, Fall 2004

REVISITING ADULTS' PERCEPTUAL LEARNING STYLE AND THEIR EDUCATIONAL LEVEL: A REPLICATION STUDY

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Abstract

This study is a replication of an original study conducted by James and Blank (1991) which examined the relationship between educational attainment and adult performance using the Multi-Modal Paired Associates Learning Test-Revised (MMPALT-II) (Cherry, 1981). The MMPALT-II was designed to measure an individual's demonstrated perceptual modality preferences. This study provides further evidence that a relationship exists among MMPALT-II subtests scores and educational attainment. However, the findings do not support the James and Blank (1991) conclusions that MMPALT-II results could be used for educational program planning, counseling, and instruction. This study concludes that the reliability and validity of MMPALT-II to measure perceptual modalities of individuals remains suspect. Further study is recommended concerning the redesign of the MMPALT-II.

Introduction

In 1991, James and Blank studied the relationship between educational attainment and adult learning styles using perceptual senses. The present study revisited that concept of a relationship between an adult's perceptual learning style and educational attainment. In order to conduct this investigation, the author again used the *Multi-Modal Paired Associates Learning Test–Revised* (MMPALT-II) (Cherry, 1981) and four educational attainment levels: (1) Non High School Graduates, (2)

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High School Graduates, (3) Some College, and (4) Graduate Students (masters degree and above). Data from the MMPALT-II were analyzed to find means, rank order, and to explore differences in order to interrelate and compare those findings with the results of James and Blank (1991).

The MMPALT-II (Cherry, 1981) is an experimental instrument to assess an individual's learning style through perceptual modality preferences. Although perceptual modality senses may affect the learning styles of individuals, other variables such as lighting, background noise, furniture arrangement, and supervision may influence the learning process (Dunn & Dunn, 1993, 1999). The relationship between perceptual modality senses and learning may vary based upon educational attainment (James & Blank, 1991). The compelling concept that cognitively processed perceptual information from the senses varies from individual to individual and also that such data can be gathered and utilized for teaching and learning to maximize educational opportunities remain uncertain. Traditionally, educators have believed in the common sense of individual learning styles and have brought primarily visual and auditory perceptual instruction into the classroom. Unsuccessful students may not employ these modes of learning effectively, not be successful in educational attainment, and perhaps not complete high school.

Since the nineteenth century, investigators have continued to question whether an individual's perceptual strengths and weaknesses are measurable and translatable to educational processes (Barbe & Milone, 1982; Carbo, Dunn, & Dunn, 1986; Dunn, 1988; Gates, 1930; Keefe, 1987; Lowenfeld, 1945; Mills, 1956a; Munsterberg, 1894; O'Brien, 1921; Whitehead, 1896). In 1979, Arter and Jenkins identified learning style concepts as key within the field of special education, but their study of the perceptual modality senses model casts serious doubts about its assumptions. In 1987, Kavale and Forness reviewed studies pertaining to models of learning styles and teaching adaptations. Using a meta-analysis procedure, they found little evidence that testing instruments for perceptual modality preferences were reliable or that teaching methods based on perceptual modality senses were effective. By 1998,

Kavale and Forness stated that the model was one of the entrenched beliefs in educational process for those with learning disabilities. They observed that once an idea becomes set in the professional education field, no amount of contrary evidence could dispel it. As proponents of the learning style model, Dunn and Dunn with former students have provided a series of positive studies (Brand, 1999; Greb, 1999; Dunn, Dunn, & Price 1996; Fine, 2003) of experimental research focusing on their test instruments, *Learning Style Inventory* (Dunn & Dunn, 1975, 1978) and *Productivity Environmental Preference Survey* (Dunn & Dunn, 1979) to determine learning styles. As strong advocates for teaching through learning styles, Carbo (1980) a student and colleague of Dunn, later co-authored with Dunn and Dunn (1986) to refute the critiques of Barbe, Swassing, and Milone (1979).

Although the term "learning style" has been widely used to describe how an individual approaches a learning situation, the MMPALT-II purports to measure seven modality preferences. Using the MMPALT-II, James and Blank (1991) studied 480 subjects to determine whether MMPALT-II scores were related to educational attainment levels. They found that subjects with less than a high school diploma had statistically significantly lower scores, and they concluded that higher scores could be a result of increased educational attainment. Koch (1998) and later, Koch, Witte, and Guarino (2001) investigated the MMPALT-II in conjunction with the *Wechsler Adult Intelligence Scale-Revised* (WAIS-R) (Wechsler, 1981b) to determine whether the MMPALT-II measured similar or dissimilar learning styles and found that the two instruments indicated distinctly different constructs. Koch (1998) and Koch et al. (2001) observed that MMPALT-II data revealed that non-high school graduates had a statistically significant difference in learning style approach from high school graduates, college graduates, and graduate students. In order to further investigate that observation, this study was undertaken to examine adults' dominant perceptual modalities and their educational attainment levels, replicating the 1991 work of James and Blank.

Method

Participants

This study used MMPALT-II data gathered from 156 subjects ranging in age from 18-67 years of age. From Koch's earlier investigations (1998; Koch et al., 2001), the 64 original subjects were combined with an additional 92 subjects tested by researchers at the University of South Florida, Tampa. This study was designed to replicate the work of James and Blank (1991) which investigated whether subtests scores on the MMPALT-II were related to educational attainment levels of the subjects. Participants in this study were grouped into four educational attainment levels: (1) Non High School Graduates, (2) High School Graduates, (3) Some College, and (4) Graduate Students (masters degree or above). The comparison of the participants in the present study with those of James and Blank (1991) is limited to four of the five educational attainment levels described in James and Blank's original investigation. The fifth educational level described by James and Blank, the Bachelor's Degree, was not replicated since the 64 participants in the Koch (1998; Koch et al., 2001) studies were originally limited to four levels of educational attainment.

Instrumentation

A group of researchers (Cherry, 1981; French, 1975; Gilley, 1976) designed and studied the MMPALT-II due to concerns about reliable and valid instruments for investigating perceptual modality preference. This perceptual modality preference instrument based on seven modalities established on concepts proposed by French (1975) is administered clinically on a one-to-one basis. To measure the five human senses, the MMPALT-II assesses the amount of information extracted by the senses to measure demonstrated perceptual modality preference. To measure the modalities, Cherry (1981) devised the seven subtests (Print, Aural, Interactive, Visual, Haptic, Kinesthetic, and Olfactory) of the MMPALT-II. Using a paired-associates testing procedure, each subtest purports to measure the examinee's recall of 10 pairs of stimuli

for each of the seven perceptual modality preferences. Raw scores range from 0 to 10 for each subtest. The MMPALT-II differs from self-report learning style inventories by assessing demonstrated modality preferences of adult learners. Studies of results of the individually administered MMPALT-II and the self-report format of the *Perceptual Modality Preference Survey* (PMPS) (Cherry, 1981) revealed a distinction between clinically observed perceptual modality preference and self-reported perceptual modality preference (Coolidge-Parker, 1989; Grady, 1992; Ryder, 1992).

The MMPALT-II was selected to measure the perceptual modality preferences of the participants. This replication study further investigated the comparable factors reported by James and Blank (1991a). MMPALT-II subtests were:

1. Print Subtest: Measures the memory of a sequential written series of letters in nonsense words paired with a real word that the examinee must later recall and identify as written text.
2. Aural Subtest: Measures auditorily discerned nonsense sounds in a nonsense word form paired with an orally presented common word that the examinee must recall in a differently sequenced series.
3. Interactive Subtest: Measures understanding acquired through verbalization while the examinee engages in conversation to recall selected pairs of words.
4. Visual Subtest: Measures the ability to process visual stimuli and representations excluding printed information that the examinee must recall from viewing abstract pictures paired with a more familiar commonly portrayed object.
5. Haptic Subtest: Measures understanding through touching and grasping to discern fine motor tasks that the examinee must recall from handling unfamiliar objects paired with a more familiar common portrayed object.
6. Kinesthetic Subtest: Measures demonstrated gross body movements that are paired for the examinee to recall after presentation of the stimulus movement.

7. Olfactory Subtest: Measures the relationship between two aromas that the examinee must distinguish from among paired stimulus aromas.

The MMPALT-II has been subjected to considerable scrutiny and research. Reliability of a test is the level of consistency or stability of the instrument over time. When test scores are used to make educational decisions for an individual, the minimum standard should be .90 (Yseldyke & Salvia, 1991). Subtest reliabilities reported by James and Blank (1991a) were: Print $r = 0.85$, Aural $r = 0.80$, Interactive $r = 0.65$, Visual $r = 0.87$, Haptic $r = 0.74$, Kinesthetic $r = 0.67$, and Olfactory $r = 0.73$. Validity, as it pertains to test instruments, refers to the extent to which an instrument measures what it is intended to measure. Specifically, test validity pertains to the inferences that can be made based upon the test results (Yseldyke & Salvia, 1991). Aspects of the validity of the MMPALT-II and the individual subtest scores have been questioned by several researchers (Hutchison, 1992; Grady, 1992; Coolidge-Parker, 1989; Koch, 1998; Koch et al., 2001; and Ryder, 1992). Smith (1996) reported that in 1981, Cherry "established content validity of the MMPALT-II by comparing the results of his measure of adult scores on the MMPALT-II with those of Gilley (1976) on the original MMPALT. He was less successful; however, in establishing construct validity..." (p. 86). Koch (1998; Koch et al., 2001) used a Pearson Product Moment Correlation to examine discriminate validity of the MMPALT-II and validity correlation coefficients ranged from .128 to .606.

Analysis

The *Multi-Modal Paired Associates Learning Test-Revised* (MMPALT-II) (Cherry, 1981) was the experimental instrument used to assess learning style to investigate the perceptual modality preferences of adult learners. Data were analyzed to find means, rank order, and to explore differences. Analysis of variance (ANOVA) and the Bonferroni procedure for multiple comparisons were selected to adjust for limited sample sizes in cross comparisons. The MMPALT-II subtests mean

scores for all subjects were calculated and rank order determined as well as the subtests mean scores and rank orders in the four educational attainment levels.

Results

Many of the results of this study were found to be similar to data in the work of James and Blank (1991a). As seen in Table 1, subtests mean scores for this study ranged from a low of 1.10 (Olfactory), ranking seventh, to 7.20 (Visual), ranking first, comparable to James and Blank with 1.30 (Olfactory), ranking seventh, to 7.35 (Visual), ranking first. The present study found two subtests were ordered differently from the James and Blank (1991a) rankings. The Haptic mean score was ranked second and Interactive ranked third, which inverted the order found by James and Blank.

Table 1
MMPALT-II Subtest Mean Scores and Ranks: Koch (present) with James & Blank (1991)

	Koch[a]		James & Blank[b]	
Subtest	Mean	Rank	Mean	Rank
Print	4.45	5	4.90	5
Aural	4.84	4	5.13	4
Interactive	4.86	3	5.41	2
Visual	7.20	1	7.35	1
Haptic	5.34	2	5.32	3
Kinesthetic	2.66	6	3.28	6
Olfactory	1.10	7	1.30[c]	7

Note: a (n = 156), b (n = 480), c (n = 416)

The results of the comparisons of subtests mean scores by educational attainment levels for this study are presented in Table 2 and those of James and Blank (1991a) are found in Table 3. The rank order of each subtest mean score was determined and presented in both tables. The rank order of the seven subtests within the four educational attainment levels in this study had Visual ranked number one, Kinesthetic sixth, and Olfactory seventh, as did James and Blank. Although James and Blank reported an identical pattern for subjects with Less than High School diploma and subjects with Some College, this study did not find similar results related to these categories. Results of this study showed none of the four educational attainment levels had the same rank order. The rank order for Less than High School graduation participants was the same rank order James and Blank found for their High School graduation participants. The range of subtests mean scores for each educational attainment level was calculated. In this study, the low was .65 (Olfactory) for the group of Less than High School diploma to 8.94 (Visual) for Graduate Students as compared to James and Blank ranging from .89 (Olfactory) for subjects with Less than High School diploma to 7.97 (Visual) for Graduate Students.

In this study, analyses of variance was used to determine statistically significant differences for mean scores of each subtest. Results of the analysis of this study are presented in Table 4 and the results found by James and Blank in Table 5. An analysis of variance procedure was used to determine whether or not statistically significant differences existed between the subtests mean scores for each of the educational attainment groups. This study found that there were significant differences at the .001 level among the various educational attainment levels for the Print, Aural, Interactive, Visual and Olfactory subtests. A significant difference was indicated at the .05 level for the Haptic subtest for the four educational levels, but no significant difference for the Kinesthetic subtest was noted. James and Blank found significant differences at the .001 level for all subtests except Olfactory, which indicated a significant difference at the .05 level. Only the Kinesthetic subtest substantially differentiated the results found in the two studies.

Table 2

Results of Post Hoc Bonferroni: Koch (present)

Subtest	Variable	N	M	Rank	SD	Ed. Level 1	2	3	4
	Ed. Level								
Print	1. Less than H.S.	48	3.02	5	2.634		*	*	*
	2. H. S. Grad.	62	4.36	5	2.650	*			*
	3. Some College	30	5.47	3	2.552	*			
	4. Grad.	16	7.13	3	2.363	*	*		
Aural	1. Less than H.S.	48	3.90	4	2.153				*
	2. H. S. Grad.	62	4.82	3	2.516				*
	3. Some College	30	5.34	4	2.719				
	4. Grad.	16	6.81	5	2.613	*	*		
Interactive	1. Less than H.S.	48	4.04	3	2.475				*
	2. H. S. Grad.	62	4.66	4	2.403				*
	3. Some College	30	5.22	5	2.837				*
	4. Grad.	16	7.50	2	2.033	*	*	*	
Visual	1. Less than H.S.	48	6.12	1	2.713			*	*
	2. H. S. Grad.	62	7.28	1	2.461				
	3. Some College	30	7.78	1	2.574	*			
	4. Grad.	16	8.94	1	1.569	*			
Haptic	1. Less than H.S.	48	5.02	2	2.529				*
	2. H. S. Grad.	62	4.96	2	2.286				*
	3. Some College	30	5.75	2	2.736				
	4. Grad.	16	7.06	4	3.435	*	*		
Kinesthetic	1. Less than H.S.	48	2.65	6	1.786				
	2. H. S. Grad.	62	2.76	6	1.625				
	3. Some College	30	2.78	6	1.641				
	4. Grad.	16	2.06	6	1.731				

n = 156 * $p < .05$

Table 3

Results of Tukey's Studentized Range Test for Comparisons of Subtests Means by Educational Level: James & Blank (1991)

Subtest	Variable	N	M	Rank	SD	Ed. Level 1	2	3	4
	Ed. Level								
Print	1. Less than H.S.	38	2.45	5	2.06			*	*
	2. H. S. Grad.	89	3.79	5	2.55			*	*
	3. Some College	185	5.56	5	2.83	*	*		
	4. Grad.	61	5.13	5	2.82	*	*		
Aural	1. Less than H.S.	38	2.58	4	1.89		*	*	*
	2. H. S. Grad.	89	4.12	4	2.33	*		*	*
	3. Some College	185	5.66	4	2.62	*	*		
	4. Grad.	61	5.84	3	2.26	*	*		
Interactive	1. Less than H.S.	38	3.61	2	2.37			*	*
	2. H. S. Grad.	89	4.38	3	2.46			*	*
	3. Some College	185	5.82	2	2.44	*	*		
	4. Grad.	61	6.18	2	2.81	*	*		
Visual	1. Less than H.S.	38	4.63	1	2.81		*	*	*
	2. H. S. Grad.	89	6.78	1	2.53	*		*	
	3. Some College	185	7.75	1	2.41	*	*		
	4. Grad.	61	7.97	1	2.59	*			
Haptic	1. Less than H.S.	38	3.00	3	1.90			*	*
	2. H. S. Grad.	89	4.44	2	2.48			*	*
	3. Some College	185	5.76	3	2.83	*	*		
	4. Grad.	61	5.77	4	2.51	*	*		
Kinesthetic	1. Less than H.S.	38	1.84	6	1.40		*	*	*
	2. H. S. Grad.	89	2.92	6	1.63	*			*
	3. Some College	185	3.36	6	1.75	*			
	4. Grad.	107	4.02	6	2.09	*	*		

n = 480 * $p < .05$

Table 4
Analysis of Variance for MMPALT-II Subtest Means by Education Level: Koch (present)

Subtest	Source	D.F.	S.S.	M.S.	F	P
Print	Between Groups	3	248.40	82.80	12.24	.0001
	Within Groups	160	1082.10	6.76		
	Total	163	1330.50			
Aural	Between Groups	3	113.88	37.96	6.24	.0001
	Within Groups	160	971.99	6.07		
	Total	163	1085.87			
Interactive	Between Groups	3	151.28	50.42	8.17	.0001
	Within Groups	160	986.49	6.16		
	Total	163	1137.77			
Visual	Between Groups	3	116.47	38.82	6.24	.0001
	Within Groups	160	995.28	6.22		
	Total	163	1111.75			
Haptic	Between Groups	3	67.77	22.59	3.40	.0190
	Within Groups	160	1060.78	6.63		
	Total	163	1128.55			
Kinesthetic	Between Groups	3	6.86	2.28	0.80	.4930
	Within Groups	160	455.68	2.84		
	Total	163	462.55			
Olfactory	Between Groups	3	38.43	12.81	9.49	.0001
	Within Groups	160	216.00	1.35		
	Total	163	254.43			

Implications and Recommendations

This replication study was undertaken to examine adults' perceptual modality preferences and their educational attainment levels using the MMPALT-II experimental test instrument. It could be concluded that the results in this study were nearly comparable to those found by James and Blank (1991a). The Visual modality was determined to be the preferred mode of successful task completion for those participants

Table 5
Analysis of Variance for MMPALT-II Subtest Means by Education Level: James & Blank (1991)

Subtest	Source	D.F.	S.S.	M.S.	F	P
Print	Between Groups	4	454.18	113.55	15.15	.0001
	Within Groups	475	3559.41	7.49		
	Total	479	4013.59			
Aural	Between Groups	4	439.57	109.89	18.40	.0001
	Within Groups	475	2837.17	5.97		
	Total	479	3276.73			
Interactive	Between Groups	4	298.95	74.74	11.77	.0001
	Within Groups	475	3015.38	6.35		
	Total	479	3314.33			
Visual	Between Groups	4	381.83	95.46	14.81	.0001
	Within Groups	475	3061.96	6.45		
	Total	479	3443.79			
Haptic	Between Groups	4	353.67	88.42	12.71	.0001
	Within Groups	475	3304.92	6.96		
	Total	479	3658.59			
Kinesthetic	Between Groups	4	131.53	32.88	10.85	.0001
	Within Groups	475	1439.50	3.03		
	Total	479	1571.03			
Olfactory	Between Groups	4	15.88	3.97	3.02	.0180
	Within Groups	411	541.15	1.32		
	Total	415	557.04			

in this study. James and Blank also found the Visual component to be the preferred perceptual modality. No matter the educational attainment level, the participants in both this study and James and Blank utilized their visual perceptual abilities most effectively. James and Blank's subjects had mean scores for Haptic and Interactive subtests which varied only .09 showing nearly identical skills; whereas, the present study found a difference of .48. For the Less than High School diploma

participants, both studies had nearly the same rank order of modality preferences, but this population had higher subtests mean scores on all seven MMPALT-II subtests. Although neither group graduated from high school, it could be concluded that participants in this study demonstrated stronger subtest task abilities than the James and Blank Non High School graduation participants. For the group with Some College, subtests mean scores were nearly alike except for Kinesthetic, and it was concluded that both groups were nearly identical in their ability to perform those subtest tasks. The two studies similarly found that higher educational attainment correlated with higher subtests mean scores. The subtests mean score for each educational level is significantly higher as the level of educational attainment rises except for Kinesthetic. It could be concluded that the progression over time to attain higher educational levels is directly related to the acquisition of abilities necessary to complete tasks of the MMPALT-II. Koch (1998; Koch et al., 2001) found that his MMPALT-II data showed that Non High School graduates had a significant difference in perceptual modality from the three other educational attainment levels. This study determined that the Non-High School graduates' subtests mean scores were statistically significantly lower than any of the three other educational attainment levels. The rank order of the scores for the Non High School graduates in this study showed nearly the same pattern as the other educational attainment levels and closely resembled the findings of James and Blank (1991).

Although the MMPALT-II purports to measure an individual's learning style through perceptual modality preferences, there was no further information from this study that the instrument is measuring perceptual modalities. Since this study was not designed to investigate the validity of the instrument, it could be concluded that the underlying construct of the instrument remains dubious. The results of this study added further evidence that a relationship exists between the MMPALT-II subtests scores and educational attainment levels supporting James and Blank's results. Further, evidence from this study does not translate strengths and weaknesses in an individual's perceptual

modality preferences to designing unique educational methodologies for individual instruction. The results of this study in themselves do not support the broad conclusions drawn by James and Blank of a direct connection among perceptual senses or the seven modalities in the MMPALT-II to educational program planning, counseling, and instruction. The analysis of the perceptual modality preferences in learning style models by such critics as Arter and Jenkins (1979) and Kavale and Forness (1987, 1990) would caution concluding statements about the relationship between a person's learning style, perceptual senses, modality preference or learning acquisition and instructional design, teaching methodology, or educational plan. Conclusions from this study do not relate any relationship to perceptual modalities and educational instructional design which has been questioned by previous investigators. It should be noted that the MMPALT-II test instrument derives raw scores from the subtests. No test manual is provided to compute such factors as a Z score, or derived score. Consideration must be given to converting these raw scores into derived scores to aid in the interpretation of a participant's performance. Although raw scores might represent varying levels of performance, they do not present the relationship of how any group or individual should have scored for interpretive understanding. The present study does give some support to a relationship between modality preference found in MMPALT-II and educational attainment, but further investigation needs to be undertaken of the validity of this experimental instrument.

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